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Stereoscopic Studies of Anatomy

Section III

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THORAX—No. 1.

ANTERIOR VIEW OF THE THORACIC WALL, SHOWING THE POSITION OF BONY AND OTHER LANDMARKS IN THE MALE.

The outlines of the clavicles and costal arches have been marked as they were to be made out by palpation, and the intercostal spaces are indicated by shading with oblique lines.

Two lines have been drawn downwards vertically from the middle of the clavicles, and these lines are continuous with the mid-poupart lines on the abdominal wall.

The transverse line extends between the lowest points of the costal arches as seen from the front.

Above the manubrium sterni is a distinct hollow, the **suprasternal fossa,** between the sternal heads of the sterno-mastoid muscles.

The **subclavicular region** is the depressed area, well seen on the right side, below the inner part of the clavicle.

The **mammary region,** indefinite in the male, is limited externally by the anterior fold of the axilla. The nipple in this subject lies over the fourth costal arch, slightly outside the midclavicular line, but it often lies on the fourth space.

The junction of the manubrium and body of the sternum is indicated by an angular projection, the angle of Ludovici, and corresponds to the junction of the second costal cartilage with the sternum.

The **infrasternal fossa** between the seventh costal cartilages is well seen.

The angle between these cartilages is variable in size, but, on an average, is about 70°.

The figures indicate—

1-7. Corresponding costal arches.
8. The ensiform cartilage.
9. The angle of Ludovici.
10. Inner end of the clavicle.
11. Suprasternal fossa.
12. Midclavicular line.
13. Subcostal plane.

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THORAX. No. 1.
SECTION III

THORAX—No. 2.

DISSECTION OF THE ANTERIOR THORACIC WALL

Skin and fasciae have been removed, and also, on the left side, the costo-sternal portion of the pectoralis major muscle, so as to expose the costal arches and the intercostal spaces.

The fat in the suprasternal fossa has been removed, to show the depth of the fossa and its lateral boundaries.

The **infraclavicular hollow** is seen to be due to the interval between the clavicular and costo-sternal parts of the pectoralis major, and the lower border of that muscle corresponds to the fifth costal arch. Below this muscle, on the right side, is a small portion of the aponeurosis of the abdominal muscles, and this has been removed on the left side so as to expose the rectus abdominis at its insertion into the fifth, sixth, and seventh costal cartilages. The fibres of the internal intercostal muscles are seen shining through the anterior intercostal membrane, but only a small portion of the external intercostals can be seen, as they do not extend beyond the junction of the ribs and cartilages.

Small anterior intercostal arteries and nerves can be seen emerging through apertures in the intercostal intervals of the left side.

The figures indicate—

1-7. Corresponding costal arches.
8. Between sternal and clavicular heads of the sternomastoid muscle.
9. Inner end of the clavicle.
10. Pectoralis major muscle.
11. Rectus abdominis insertion.
12. Aponeurosis of abdominal muscles.

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THORAX—No. 3.

WALL OF THORAX.

The sterno-costal portions of the pectoralis major muscles have been removed, as well as the upper parts of the external oblique and rectus abdominis muscles, and the intercostal spaces opened up by the removal of the intercostal membrane and muscles and the triangularis sterni in each.

The inner ends of the fifth and sixth costal cartilages of the left side have also been taken away, to show the relations of the pleural membrane and the internal mammary vessels.

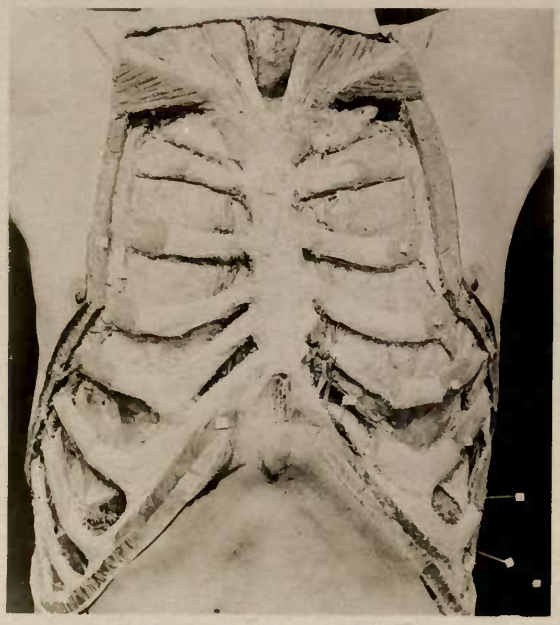
The pleural membranes are seen to be bulged forwards in the upper two spaces, and to be in relation to the internal mammary vessels from which they were separated by the triangularis sterni muscle.

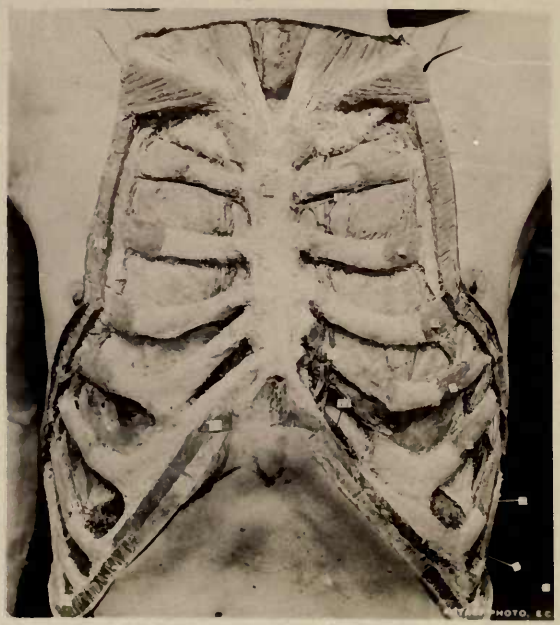
The membranes of the two sides are seen to be arranged differently, that of the left side sloping outwards from the lower part of the sternum, behind the fifth costal cartilage, while the right pleura passes down to a lower level. In the midclavicular line, however, the two membranes pass downwards to practically the same level.

The internal mammary vessels lie about half an inch external to the side of the sternum, and terminate in the sixth interspace. Two venae comites accompany each artery in the lower part of its course, but unite in the second interspace to form a single trunk.

The figures indicate—

1-9. Corresponding costal arches.
10. The angle of Ludovici.
11. Pectoralis major muscle.
12. Intercostal muscles.
13. Rectus abdominis muscle.
14. Diaphragm.
15. External oblique muscle.
16. Internal mammary artery giving off intercostal branches.
17. Musculo-phrenic artery.
18. Internal mammary artery and vein





THORAX. No. 3
SECTION III

THORAX—No. 4.

THE PLEURAL MEMBRANES SEEN FROM THE FRONT.

The anterior thoracic wall has been removed, leaving the parietal pleura in position.

The limits of the two membranes are seen, below the first costal arch, to follow these lines:—

The **Right pleura**, passing down behind the sternum along an oblique line from right to left, crosses the mesial plane at the lower part, and, slightly overlapping the corresponding membrane of the opposite side, it extends down to a point behind the junction of the body of the sternum with the ensiform cartilage.

From this point it passes outwards behind the seventh costal cartilage.

The **Left pleura**, on the other hand, deviates outwards from the middle of the sternum in the fourth interspace, leaving an interval in which the anterior surface of the pericardium is seen, and then passes out across the fifth interspace.

The lateral line of reflection is practically the same on the two sides at and beyond the mid-clavicular line, where in this subject the lowest level is at the seventh chondro-sternal junction.

It should be noted that this is one space higher than is usually said to be the case, and also that here the area of pericardium uncovered by pleura is smaller than usual, though the usual cause of diminution, emphysema of the lungs, is not present.

The figures indicate—

1. Manubrium sterni.
2. Xiphi-sternal junction.
3. Internal mammary vessels, cut across.

4-9. Corresponding costal arches.

10. Anterior surface of the pericardium

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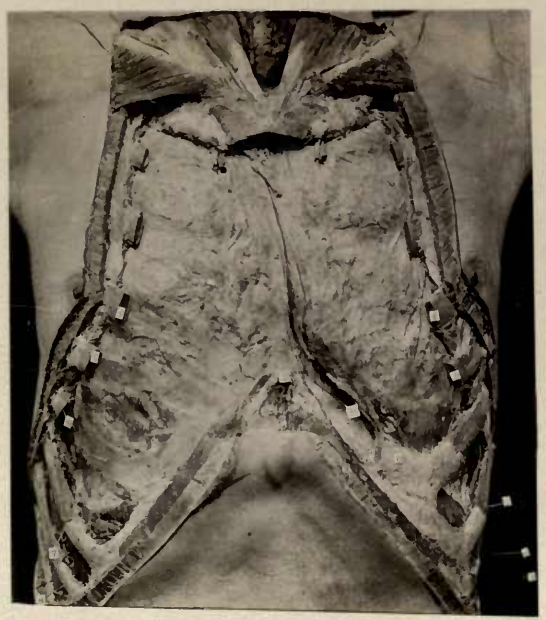

THORAX. No. 4.
SECTION III.

THORAX—No. 5.

THE LUNGS IN RELATION TO THE CHEST WALL, SEEN FROM THE FRONT.

The anterior chest-wall has been removed, and also the parietal pleural membrane lining it, leaving the lines of pleural reflection. The apparent interval between the lungs and the pericardium and diaphragm was occupied by a quantity of sub-pleural fatty tissue, which has been taken away.

The **anterior borders of the lungs** come into apposition with one another behind the lower part of the manubrium sterni, and from that point the margin of the right lung passes vertically downwards as far as to the inner end of the seventh costal cartilage. The **lower border** then passes outwards to a point in the midclavicular line behind the sixth costal arch.

The **anterior border of the left lung**, on the other hand, deviates slightly outwards, and at the fourth costal cartilage, turns outwards from behind the sternum, and passes to the fifth interspace, where the margin becomes horizontal, and, in the midclavicular line, is at practically the same level as the right lung.

The interval between the margins of the lungs and the lines of pleural reflection should be noted.

A triangular area of pericardium is seen, uncovered by lung tissue, extending from the middle of the sternum between the fourth cartilage and the seventh, outwards and downwards towards the position of the apex-beat, and this is the area of **superficial cardiac dulness.**

The figures indicate—

1. Manubrium sterni.
2. Xiphi-sternal junction.
3. Reflection of left pleura on to pericardium
4-9. Corresponding costal arches.
10. Pericardium.

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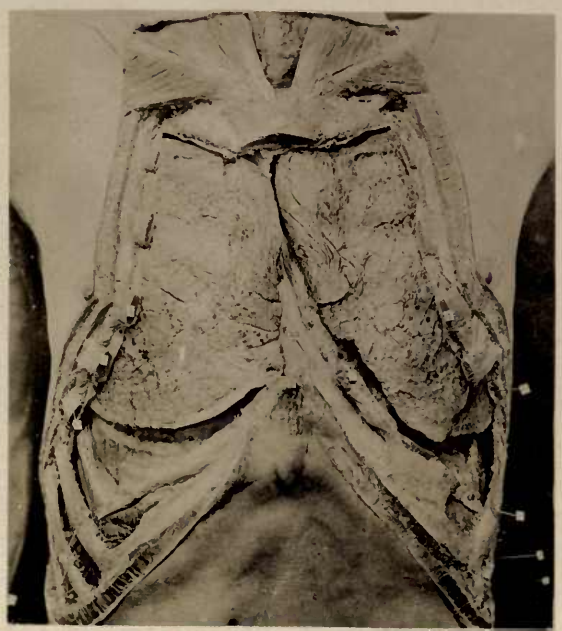

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THORAX—No. 6.

PLEURAL CAVITY AND LOWER BORDER OF LUNG, VIEWED FROM THE RIGHT SIDE.

The coverings of the chest wall have been removed from the lateral aspect, and the lower intercostal spaces opened up, to show the line of pleural reflection and the lower margin of the lung.

The mid-axillary line is shown by a white thread.

The line of reflection of the pleural membrane from the chest-wall on to the diaphragm is seen to curve downwards, until, in the MID-AXILLARY LINE, it crosses the TENTH costal arch, and from this level it passes nearly horizontally backwards.

The lower margin of the lung lies at a much higher level, an interval of four inches intervening between it and the lowest limit of the pleural cavity in the mid-axillary line.

The condition seen here is that of complete expiration, and in that state the lower margin of the lung may be indicated on the surface by a line drawn horizontally round the body about 1½ ins. below the nipple, crossing the MID-AXILLARY line at the EIGHTH costal arch. The amount of movement of this margin in respiration is said to be about 1½ ins., and therefore the position of this margin in full inspiration would be about 1½ ins. lower down.

The figures indicate—

1. Pectoralis major muscle (margin).
2. Serratus magnus „ „
3. Latissimus dorsi „ „
4. External oblique muscle (margin).
5–11. Corresponding costal arches.
12. Diaphragm.
13. Lower part of lung.

The line 3 to 10 indicates the mid-axillary line.

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THORAX No. 6.
SECTION III

THORAX—No. 8.

THE HEART AND PERICARDIUM WITH THE STERNUM AND LEFT LUNG IN POSITION.

The right lung has been removed and portions of the fifth and sixth costal arches of the left side.

The pericardium is seen to project about one inch to the right of the margin of the sternum, from the second interspace to the fifth; in the second interspace it covers the great vessels, and, lower down, the heart itself.

The area of pericardium not covered by the left lung is seen to lie mainly below the fifth left costal arch, but it is often at a higher level.

The lower end of the great fissure of the left lung is seen at the level of the sixth chondro-sternal junction, dividing the lung into an upper and a lower lobe.

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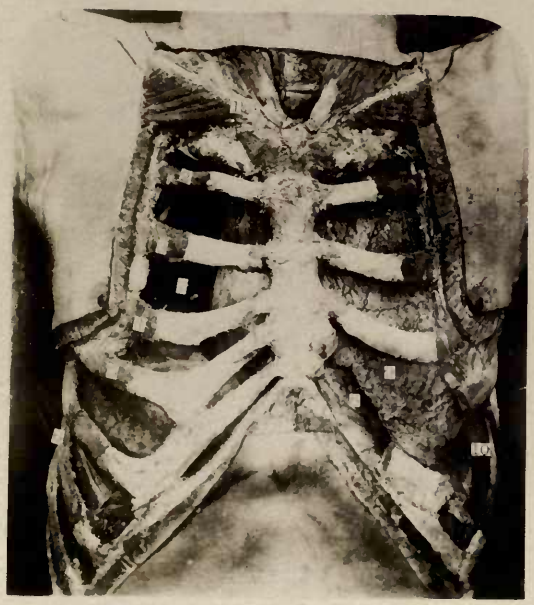
The figures indicate—

1-6. Corresponding costal arches.
7. Pericardium covering the right auricle.
8. Area of pericardium not covered by the left lung.
9. Incisura cardiaca.
10. Great fissure of left lung



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THORAX—No. 9.

PERICARDIUM, PHRENIC NERVES, AND THYMUS GLAND, SEEN FROM THE FRONT.

The lungs have been removed, and the mediastinal pleura stripped from the surface of the pericardium.

The fibrous pericardium is a strong, conical sac, the base attached to the diaphragm, the apex being lost on the great vessels which enter and emerge from the heart. Occupying the middle mediastinum, it is in contact laterally with the mediastinal pleura, phrenic nerves and their accompanying vessels, and it is separated from the anterior chest-wall by the anterior margins of the lungs and pleural sacs, except over a triangular area previously indicated, and by the lower part of the thymus gland.

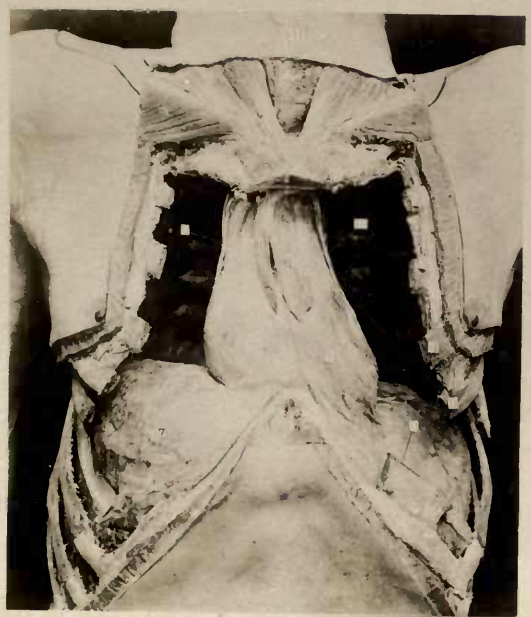
The lower part of the thymus gland, which, in this specimen (adult male), is probably not larger than usual, is seen to extend downwards in front of the pericardium for some distance, in the form of two elongated processes. The pericardium is thrown into wrinkles, on account of the contracted state of the left ventricle.

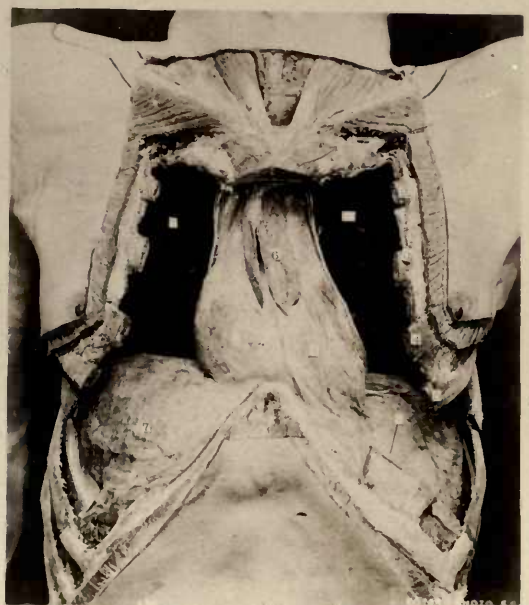
The phrenic nerves can be seen to adapt themselves closely to the outline of the pericardium, and, at a higher level, the right nerve lies on the side of the superior vena cava.

The right cupola of the diaphragm is seen to rise to a slightly higher level than the left.

The figures indicate—

1. Pericardium.
2–5. Corresponding costal arches.
6. Thymus gland.
7–8. The cupolae of the diaphragm.
9. The right phrenic nerve in apposition with the superior vena cava.
10. Left phrenic nerve lying on the side of the pericardium.





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SECTION III

THORAX—No. 10.

ANTERIOR SURFACE OF THE HEART IN TOPOGRAPHICAL RELATION TO THE CHEST-WALL.

The lungs have been removed, and the sternum and ribs replaced.

The pericardium has been removed from the front of the heart.

The following lines indicate the outline of the heart as seen from the front:—

(1) The lower border extends nearly horizontally from the sixth right costal cartilage, three-quarters of an inch from the right margin of the sternum to the apex beat in the fifth left interspace.

(2) The upper border extends behind the sternum immediately above the third costal cartilages, extending beyond the sternal margin about an inch on the left side, and about half an inch on the right.

(3) The right and left margins may be indicated by lines slightly convex outwards, joining the corresponding extremities of the other lines.

The depth of different portions from the surface was as follows:—Measurements being taken in each case from the posterior aspect of the sternum or costal arch. The **aorta** is at a depth of one inch from the second right costal cartilage, the tip of the **right auricle** is one inch from the third right costal cartilage, the **apex** of the heart is at the same depth from the fifth left costal arch, and the root of the **pulmonary artery** is rather more than an inch from the sternum.

The anterior surface of the heart and great vessels shows a curvature adapted to the curvature of the chest-wall, so that nearly all points on this surface lie at a depth of almost exactly one inch.

A portion of the anterior auriculo-ventricular furrow is seen running obliquely across the heart, and the transverse width of the heart is in this case four inches.

The figures indicate—

1-7. Corresponding costal arches.
8. Diaphragm.
9. Left ventricle, slightly above the apex.
10. Pulmonary artery.
11. Superior vena cava and right phrenic nerve.
12. Right auricular appendix.
13. Anterior auriculo-ventricular sulcus.

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THORAX—No. 11.

INTERIOR OF THE RIGHT SIDE OF THE HEART, TO SHOW THE VALVES, ETC., IN POSITION.

The anterior wall of both the right auricle and ventricle has been removed, leaving only the line of the auriculo-ventricular furrow. The auricle is seen to form the whole of the right margin of the heart, while the ventricle forms a considerable portion of the lower border, and the apex of the heart is formed by the left ventricle.

The interventricular septum can be seen, obliquely situated, passing from in front backwards and to the right, and its convex surface projects into the cavity of the right ventricle.

The common pericardial investment of the pulmonary artery and aorta can be seen at the upper part, where the serous layer is reflected on to the vessels.

The figures indicate—

1-7. Corresponding costal arches.
8. Anterior interventricular furrow with a branch of the left coronary artery.
9. Musculi pectinati of auricle.
10. Right coronary artery in anterior auriculo-ventricular furrow.
11. Anterior papillary muscle.
12. Infundibular cusp of tricuspid valve.
13. Pulmonary valve.

THORAX. No. 11.
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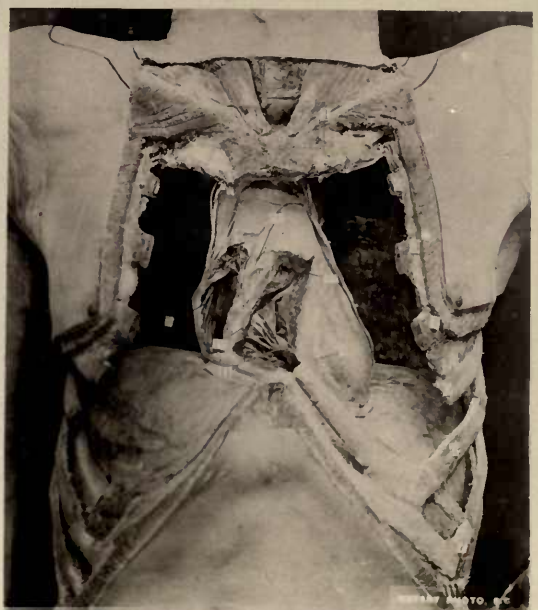

THORAX—No. 12.

INTERIOR OF THE RIGHT AURICLE AND VENTRICLE IN TOPOGRAPHICAL RELATION TO THE CHEST-WALL.

View from in front and slightly from the right side to show the thoracic skeleton, and, at the same time, the parts which lie under cover of it

The anterior auriculo-ventricular groove is seen to run from the middle of the sternum at the level of the third costal arch downwards and to the right, so that the cavity of the auricle lies almost entirely to the right of the sternum, while the ventricle lies behind the sternum and the inner end of the fifth right interspace.

Looking at the heart from the front, it may be said that the right auricle lies to the right of the sternum, the right ventricle occupies the area behind the sternum, and the left ventricle that to the left of the sternum.

The tip of the left auricular appendix is not seen here, but it usually appears on the left of the pulmonary artery.

The pulmonary valve lies behind the third left chondro-sternal junction, and the right auriculo-ventricular orifice behind the sternum opposite the extremity of the fourth intercostal space of the right side.

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The figures indicate—

1-7. Corresponding costal arches.
8. Anterior interventricular furrow, with branch of left coronary artery.
9. Musculi pectinati of auricle.
10. Right coronary artery.
11. Anterior papillary muscle of ventricle.
12. Infundibular cusp of tricuspid valve.
13. Pulmonary valve.

SECTION III
THORAX No. 12.

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THORAX—No. 13.

INTERIOR OF THE VENTRICULAR CHAMBERS FROM THE FRONT.

The anterior wall of both the ventricles and of the right auricle has been removed, and also most of the interventricular septum, the infundibular cusp of the tricuspid valve, and the front of the right auriculo-ventricular ring. The pulmonary artery and the aorta have also been opened at their roots. This view illustrates clearly the wide interval which exists between the apertures leading to and from the right ventricle and also the close proximity to one another of the corresponding apertures of the left side.

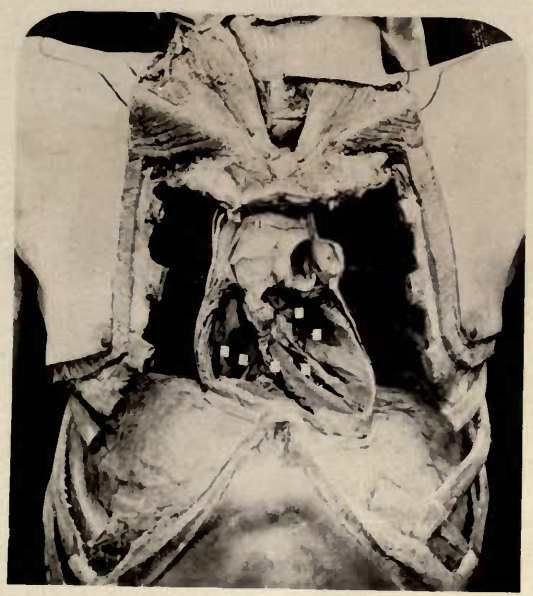
In the right auricle some of the musculi pectinati are seen, but the tip of the auricular appendix which projected in front of the root of the aorta, and has left an impression there, has been removed.

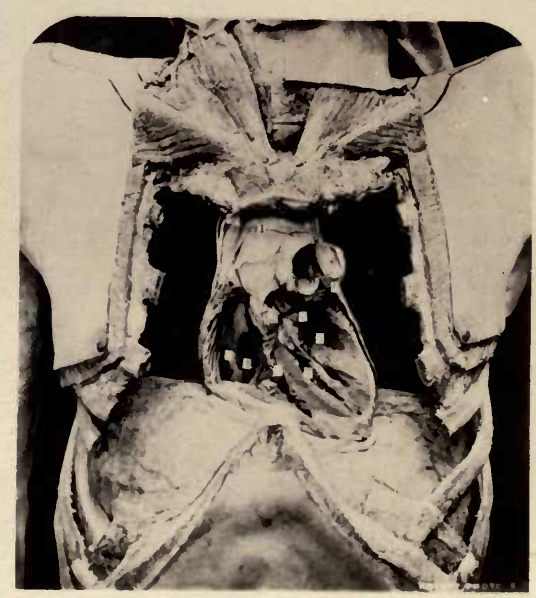
In the right ventricle portions of the marginal and septal cusps are seen, and, in the left ventricle, the anterior or aortic cusp of the mitral valve, with the chordae tendineae and papillary muscle.

The segments of the aortic and pulmonary valves are arranged in an anterior and posterior set in each; in the pulmonary one segment is placed posteriorly (6), and in the aortic two, both of which are seen.

The figures indicate—

1. Pericardial reflection from pulmonary artery and aorta.
2. Where the superior vena cava enters the right auricle, and the position of the pericardial reflection from it.
3. Fossa ovalis.
4. Septal cusp of tricuspid valve.
5. Interventricular septum, and cut chordae tendineae of septal cusp.
6. Posterior cusp of pulmonary valve.
7. Anterior papillary muscle of left ventricle.
8. Anterior (aortic) cusp of mitral valve.
9. Cusps of aortic valve.





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THORAX—No. 14.

POSITION OF THE VALVES IN RELATION TO THE CHEST WALL.

View from in front, to show the interior of the heart and at the same time the sternum and costal cartilages. The position of the various orifices and valves is seen to be as follows:—

The PULMONARY ORIFICE is the most superficial, and lies behind the junction of the third left costal cartilage with the sternum. The pulmonary artery itself lies behind the inner end of the second left interspace and the second left costo-sternal articulation.

The AORTIC OPENING lies more deeply and at a lower level, behind the left side of the sternum at the lower border of the third costal cartilage.

The MITRAL ORIFICE lies very deeply behind the left half of the sternum at its junction with the fourth left costal cartilage. The TRICUSPID ORIFICE, the largest of all, and oblique in direction, lies behind the sternum, opposite the extremity of the fourth intercostal space of the right side.

The figures on the heart indicate—

1. Pericardium.
2. Where the superior vena cava enters the right auricle.
3. Overlies the eustachian valve.
4. Septal cusp of tricuspid valve.
5. Interventricular septum.
6. Pulmonary valve.
7. Papillary muscle of left ventricle.
8. Aortic cusp of the mitral valve.
9. Lies below and to the right of the aortic valve.

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SECTION III

THORAX—No. 15.

THE SUPERIOR APERTURE OF THE THORAX, AND STRUCTURES PASSING THROUGH IT, VIEWED FROM IN FRONT AND SLIGHTLY FROM ABOVE.

The superior aperture of the thorax is bounded by the first dorsal vertebra, the first costal arches, and the manubrium sterni.

The apices of the pleural membranes rise as high as to the neck of the first rib on each side. Between them is a narrow interval, in which numerous important structures are packed together.

The oesophagus lies at the back, and to the left side.

In front is the trachea, the innominate artery crossing in front of it behind the manubrium sterni, and the left innominate vein crossing in front of that.

The left subclavian artery is seen occupying the groove in the apex of the left lung.

The letters indicate—

A. The 7th cervical vertebra. B. The 1st dorsal vertebra. C. The 2nd dorsal vertebra.

The large 1 is placed on the first costal arch.

The figures indicate—

1. Apex of pleura, covering the lung.
2. Innominate veins.
3. Innominate artery.
4. Right subclavian artery.
5. Left common carotid artery
6. Left subclavian artery.
7. Trachea.
8. Oesophagus.
9. Right vagus.

The left vagus is seen lying between the left common carotid and left subclavian arteries.

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THORAX. No. 15.
SECTION III.

THORAX.

BACK—No. 1.

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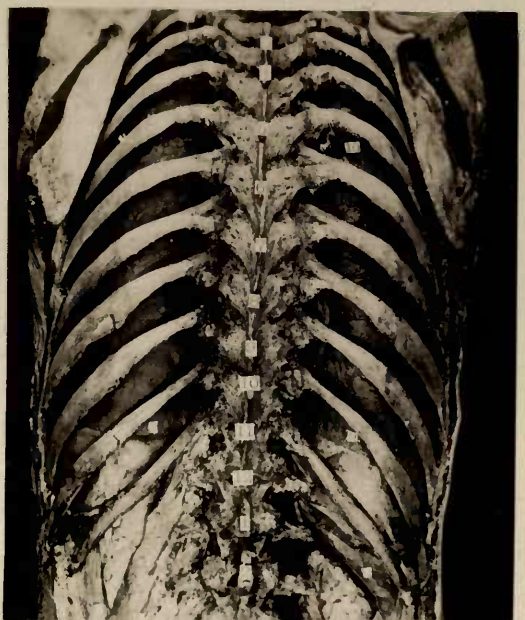
In the dissections illustrated in this and the following four views, the subject after being hardened by formalin injections, was fixed by being embedded in plaster of Paris, so as to secure complete immobility during and after the removal of the vertebral column and the ribs. The subject was a female, who showed no marked evidence of disease of the heart or lungs. The curvature of the dorsal portion of the spine was perhaps somewhat greater than is found in a younger subject. The relations of the deeper parts to the surface are represented as they were found in this subject, but it should be borne in mind that after death, the viscera tend to be displaced downwards in relation to the spine, and this probably accounts for the somewhat lower position than usual which they occupy here.

The lower margin of each of the lungs is seen to descend as far as to the level of the eleventh dorsal spine, and is the same on both sides of the body. The lower limit of the pleura, as it approaches the spine on the right side of the body, passes below the level of the twelfth rib and descends as far as to the transverse process of the first lumbar vertebra. On the left side, it passes along under cover of the twelfth rib, and only descends below this rib for a short distance near the spine, where it is found in the usual position, *i.e.* in the interval between the twelfth rib and the transverse process of the first lumbar vertebra.

The oblique fissure of the lung begins, on the left side, on a level with the spine of the second dorsal vertebra, but as often happens, on the right side it is as low as the spine of the fourth dorsal vertebra. From its origin, the fissure passes obliquely downwards and outwards, under cover of the infraspinous region of the scapula.

Large numbers indicate corresponding lumbar dorsal spines. L indicates the quadratus lumborum muscle. The small numbers indicate—

1. Left kidney.
2. Diaphragm.
3. Left lung, inferior margin.
4. Descending colon.
5. Liver.
6. Right kidney.
7. Ascending colon.
8. Diaphragm.
9. Lung.
10. Great fissure of right lung.
11. Great fissure of left lung.



THORAX BACK. No. 1.
SECTION III

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THORAX.

BACK—No. 2.

THE GREATER PART OF THE SPINE HAS BEEN REMOVED WITH PORTIONS OF THE ATTACHED RIBS, AND THE LUNGS LIFTED OUT AFTER DIVIDING THE ROOT ON EACH SIDE.

The structures shown lie mainly in the posterior mediastinum.

Aorta. The arch of the aorta, after passing backwards, reaches the vertebral column on the left side of the middle line. The aorta then passes downwards and bends slightly to the right, until it reaches the mesial plane. To its right side lies the vena azygos major, which arches forwards over the root of the right lung, and on the left side the aorta is covered by the left mediastinal pleura.

Root of the right lung. The bronchus has been divided just beyond the origin of the eparterial branch, and the eparterial and the main bronchus appear as one structure. The pulmonary veins have been divided close to their termination in the left auricle, and appear as a single vessel. The right pulmonary artery lies in front of the bronchus and between the eparterial and the main bronchus in a vertical direction.

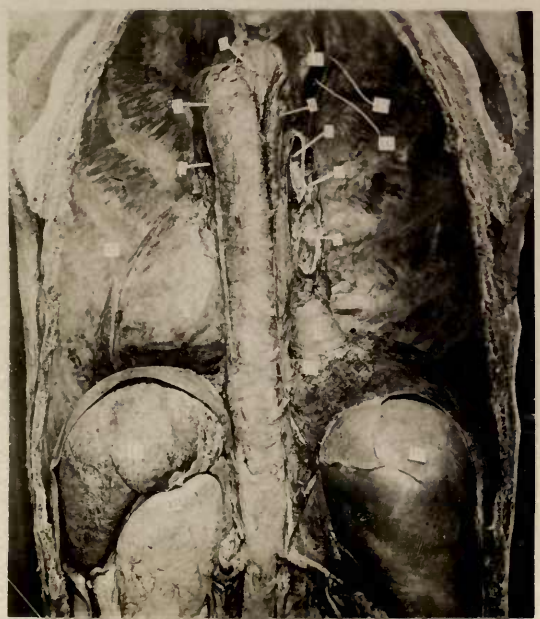
Diaphragm. The right cupola rises rather higher than the left, and is seen to be pierced by the vena cava inferior, which then passes to the right auricle. A small part of the posterior and outer surface of this vessel lies free in the thorax, and comes into contact with the lower margin of the right lung, but the remainder of the vessel lies inside the pericardium.

Spleen. This organ is of a typical shape and size in this specimen, and its relation to the left cupola of the diaphragm should be noted.

On the right side is seen a small portion of the liver, which is not invested by peritoneum, known as the bare area of the liver. It is triangular in shape, and is bounded by the upper and lower layers of the coronary ligament.

The figures indicate—

1. Inferior vena cava.
2. Aortic arch.
3. Œsophagus.
4. Vena azygos major.
5. Root of left lung (centre of).
6. Right bronchus.
7. Right pulmonary artery.
8. Right pulmonary veins, divided at entrance to left auricle.
9. Left ventricle.
10. Liver.
11. Spleen.
12. Left kidney.
13. Aorta and margin of pleura.
14. Innominate artery.
15. Internal mammary artery
16. Superior vena cava



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SECTION III

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THORAX.

BACK.—No 3.

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THE STRUCTURES SHOWN IN THE FORMER VIEW ARE NOW SEEN IN TOPOGRAPHICAL RELATION TO THE SPINE AND THE RIBS.

Aorta. The arch of the aorta reached the left side of the spine at a point which was vertically in front of the spine of the third dorsal vertebra. The obliquity of this portion of the view at first sight appears to make the level somewhat lower than this, but careful examination reveals that this is the proper level.

Diaphragm. The right cupola ascends as high as to lie between the eighth and ninth dorsal spines, while the left cupola is between the ninth and tenth. The scapulæ are somewhat oblique, but the lower angle of each is practically over the seventh rib.

Spleen. The relation of the spleen to the surface is very clearly brought out. The lower margin (posterior border) lies along the upper border of the twelfth rib, and extends from the side of the vertebral column as far as to the posterior axillary line. The outline of the organ may be indicated by drawing a line to represent the lower border along the rib for that distance, and joining the ends by an arch which extends as far up as to the tenth rib.

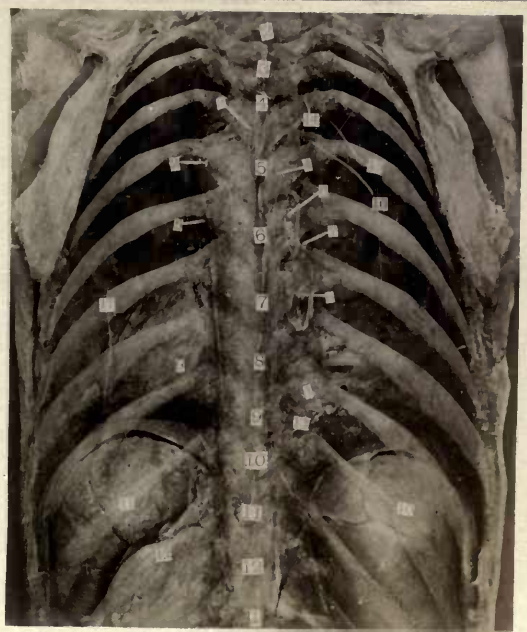
Liver. The upper border of the liver passes up into the ninth intercostal space, and the liver is covered by the lower three ribs behind, and passes down about an inch below the twelfth rib.

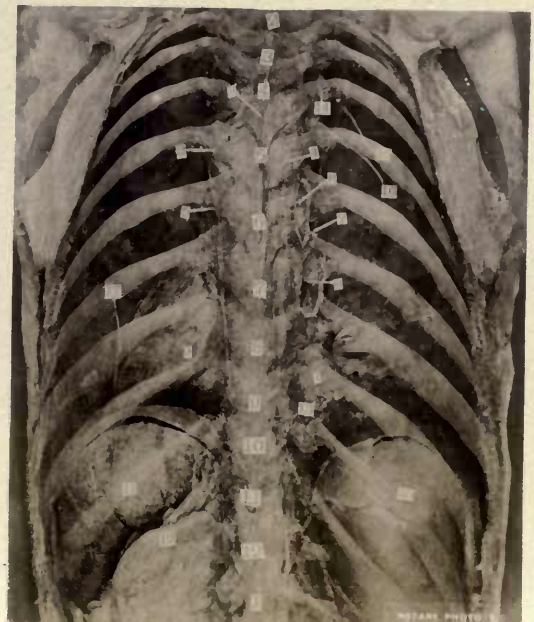
This view should be focussed with great care, so as to bring out clearly the structures which lie at different depths from the surface.

The large numbers rest upon the spines of corresponding dorsal and lumbar vertebrae.

The small numbers indicate—

1. Inferior vena cava.
2. Aortic arch.
3. Œsophagus.
4. Vena azygos major.
5. Root of right lung (centre of).
6. Right bronchus.
7. Right pulmonary artery.
8. „ „ veins, joining left auricle.
9. Left ventricle.
10. Liver.
11. Spleen
12. Left kidney.
13. Aorta, and margin of pleura.
14. Innominate artery.
15. Internal mammary artery.
16. Superior vena cava.





THORAX BACK. No. 3.

SECTION III

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THORAX.

BACK—No. 4.

THE SPLEEN AND LEFT KIDNEY AND PORTIONS OF THE AORTA AND ŒSOPHAGUS HAVE BEEN REMOVED, TO SHOW THE HEART, ROOTS OF THE LUNGS, ŒSOPHAGUS, PANCREAS, AND STOMACH, FROM BEHIND.

Œsophagus. Below the bifurcation of the trachea, the œsophagus passes rather to the right, and then curves gradually forwards, and to the left side. Just above the point where it pierces the diaphragm, there is a well-marked dilatation, which is known as the **ampulla phrenica.** This ampulla is not invariably present, but on the other hand it may become very much enlarged, and contain fluids and food which do not reach the stomach. Between this ampulla and the stomach is a deep groove in which lay a strong muscular band, which formed part of the diaphragm, and which can probably act as the sphincter for the cardiac orifice of the stomach. The ampulla fills up the small angular interval between the diaphragm and the pericardium. The right vagus is seen passing on to the back of the œsophagus in its course to the posterior surface of the stomach.

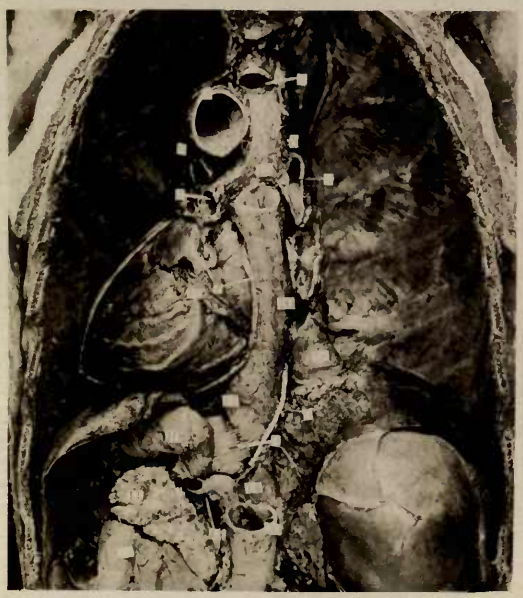
Bronchi. The left bronchus is longer, narrower, and more horizontal than the right one.

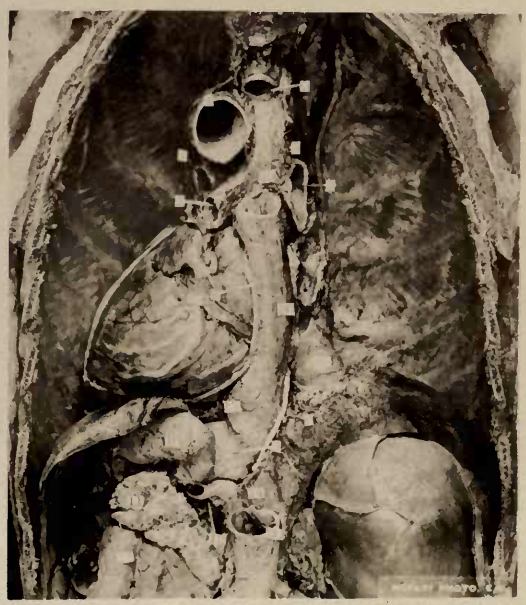
Heart. The portion of the heart which is seen, includes the basal surface—the greater part of this being composed of the left auricle—and the left border, formed by the left ventricle. The great cardiac vein lies in the auriculo-ventricular groove.

Stomach. The fundus of the stomach arches up above the level of the cardiac orifice. At a lower level lie the splenic vessels and the tail of the pancreas.

The figures indicate—

1. Aortic arch.
2. Œsophagus.
3. Right bronchus.
4. Left bronchus.
5. Vena azygos major.
6. Left pulmonary artery.
7. Pericardium, cut edge.
8. Right vagus.
9. Constriction on œsophagus.
10. Stomach, fundus.
11. Tail of pancreas.
12. Splenic vessels.
13. Descending colon.
14. Diaphragm, muscular band.
15. Auriculo-ventricular sulcus.
16. Œsophagus.
17. Ampulla phrenica.
18. Inferior vena cava.
19. Bifurcation of trachea.
20. Abdominal aorta, commencement of.





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THORAX.

BACK—No. 5.

THE STRUCTURES SEEN IN THE PRECEDING VIEW ARE SHOWN IN TOPOGRAPHICAL RELATION TO THE SPINE AND THE RIBS.

The surface relationships seen here are numerous and important.

Heart. The heart extends from between the fifth and sixth dorsal spines above down to the ninth dorsal spine below, but the basal surface, *i.e.* as far down as to the auriculo-ventricular groove, extends only to the eighth dorsal spine. The apex of the heart lies in front of the ninth rib below the lower angle of the scapula, and slightly internal to it.

Trachea. The lower margin of the bifurcation of the trachea lies in front of the spine of the fifth dorsal vertebra, and the roots of the lungs, which are of considerable vertical extent, lie in front of the fifth, sixth, and seventh dorsal spines.

Stomach. The cardiac orifice of the stomach lies at the level of the tenth dorsal spine, while the fundus passes upwards almost to the spine of the ninth dorsal vertebra.

The splenic flexure of the colon and the tail of the pancreas come to lie under cover of the eleventh rib.

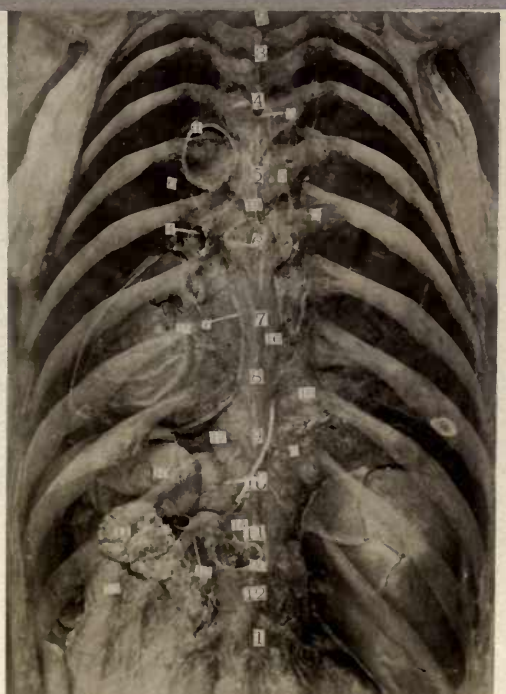
Very considerable differences exist between the statements made in different text books as to the level of the above structures in relation to the spines of the vertebræ.

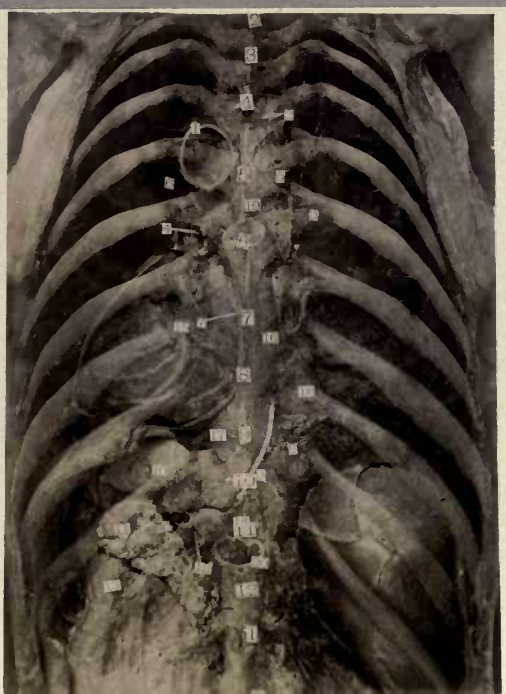
The bifurcation of the trachea, *e.g.* is often said to be at the level of the third dorsal spine. The bifurcation is certainly at a lower level than that in this specimen. The level of the other structures may be taken as being fairly typical, but apparently considerable individual variations may be found.

The large numbers rest upon corresponding dorsal and lumbar spines.

The small numbers indicate—

1. Aortic arch.
2. Œsophagus.
3. Right bronchus.
4. Left bronchus.
5. Vena azygos major.
6. Left pulmonary artery.
7. Pericardium, divided.
8. Right vagus nerve.
9. Constriction on œsophagus.
10. Fundus of stomach.
11. Tail of pancreas.
12. Splenic vessels.
13. Descending colon.
14. Diaphragm.
15. Auriculo-ventricular sulcus.
16. Œsophagus.
17. Ampulla phrenica.
18. Inferior vena cava.
19. Bifurcation of trachea.
20. Commencement of abdominal aorta.





THORAX. BACK. No. 5.

SECTION III

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THORAX.

HEART and PERICARDIUM—No. 1.

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TWO SPECIMENS VIEWED FROM IN FRONT.

A. The heart, great vessels, and trachea have been removed from the body in one piece, and the front of the pericardium removed.

The characteristic, somewhat quadrilateral shape of the antero-superior surface of the heart, subdivided by the auriculo-ventricular and interventricular furrows, is well seen. This surface is composed of the ventricles mainly, but the right auricular appendix and the tip of the left auricular appendix also come into it. Above the heart itself, three great vessels lie nearly vertically side by side, the superior vena cava, the ascending aorta, and the pulmonary artery, flanked on either side by the auricular appendix.

The prominence of the right ventricle from which the pulmonary artery springs is very distinct.

B. The heart, enclosed in pericardium has been removed, with the aortic arch, and the thymus gland.

The size of the thymus in this view (also from an adult) is noticeable.

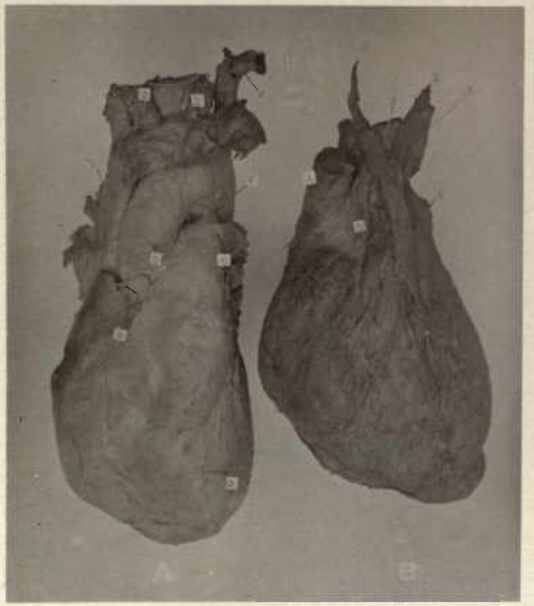
The figures indicate—

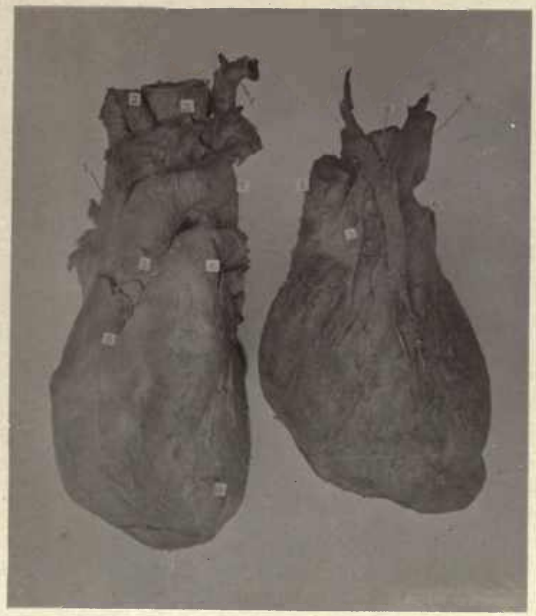
IN BOTH SPECIMENS.—

1. Superior vena cava.
2. Innominate artery.
3. Left common carotid artery.
4. Left subclavian artery.
5. Ascending aorta.
6. Pulmonary artery.

IN A:—

7. Ligamentum arteriosum.
8. Right auricular appendix.
9. Anterior interventricular furrow.





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THORAX.

HEART and PERICARDIUM—No. 2.

TWO SPECIMENS VIEWED FROM BEHIND AND SLIGHTLY FROM BELOW.

In **A**:—The **aortic arch** lies first in front of the trachea and then to the left of the trachea, of the oesophagus (9), thoracic duct, and left recurrent laryngeal nerve.

The **descending thoracic aorta**, commencing at the lower border of the 4th dorsal vertebra, passes downwards and to the right, behind the root of the left lung and the oesophagus.

The **inferior surface of the heart**, flattened in relation to the diaphragm, is separated from the antero-superior surface by the rounded left margin, and is traversed by the inferior interventricular furrow.

The **base of the heart** covered by pericardium, lies in front of the descending thoracic aorta, the oesophagus, and the lower right pulmonary vein; the inferior vena cava (6) partly invested by pericardium (14) opens into its lower right angle, the superior into the upper.

The principal constituents of the right pulmonary root are the **right bronchus** (10) giving off its eparterial branch, the right pulmonary artery (7) and veins (8).

In **B**:—The openings of the great vessels into the pericardium, which is grooved for the trachea (9), the right bronchus (10), and the oesophagus (11).

When the heart is contracted, a tongue-shaped process of pericardium projects forwards from the apex.

The figures indicate—

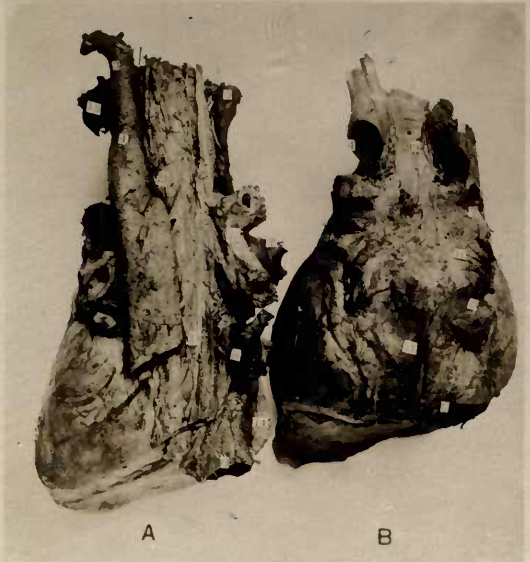
A

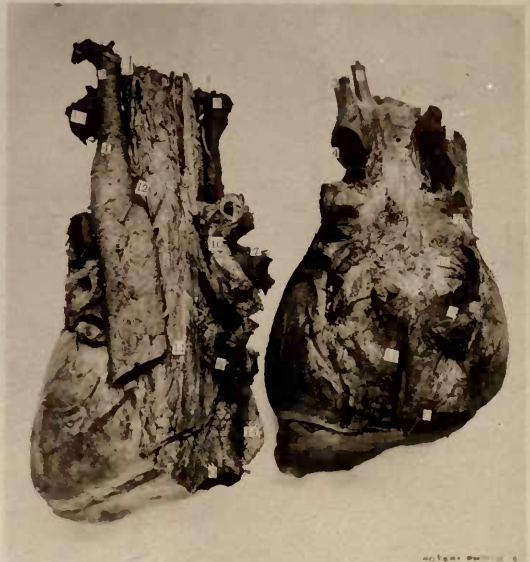
1. Innominate artery.
3. Left subclavian artery.
4. Aorta.
5. Right innominate vein passing into superior vena cava.
6. Inferior vena cava, with pericardium (14).
7. Right pulmonary artery.
8. Right pulmonary veins.
9. Oesophagus.
10. Right bronchus.
11. Oesophagus, with plexus gulae.
12. Right and left aortic intercostal arteries.
13. Left innominate vein.
14. Pericardium.

B

1. Innominate artery.
2. Left common carotid artery.
3. Left subclavian artery.
4. Aorta.
5. Superior vena cava receiving vena azygos major.
7. Right pulmonary artery.
8. Right pulmonary veins.
9. Groove for trachea.
10. Groove for right bronchus.
11. Groove for oesophagus.

THORAX HEART & PERICARDIUM No. 2.
SECTION III





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THORAX.

HEART and PERICARDIUM—No. 3.

TWO SPECIMENS VIEWED FROM THE LEFT.

The left-hand specimen (A.) shows the heart, from which the pericardium has been removed, with the great vessels, the trachea, and root of left lung.

The aorta is seen to form an arch over the root of the lung, the aortic arch lying above, and the descending thoracic aorta behind.

The left bronchus passes outwards from the bifurcation of the trachea, and joins the pulmonary vessels.

The right-hand specimen (B.) consists of the heart, aorta, and pericardium, which have been removed in one mass, and it shows the impressions on the posterior aspect of the pericardium made by the structures with which it lay in immediate contact, especially by the left bronchus and by the oesophagus on the back near the lower margin.

The redundancy of pericardium is well indicated by the wrinkles on its surface, and by the tail which projects from the region of the apex of the heart.

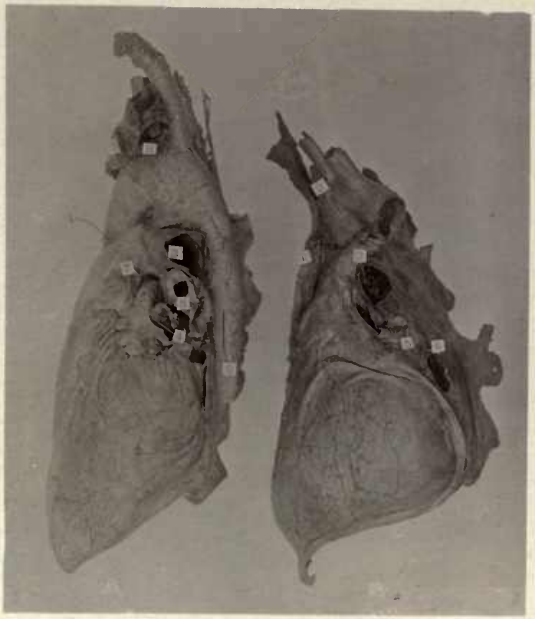
The figures indicate—

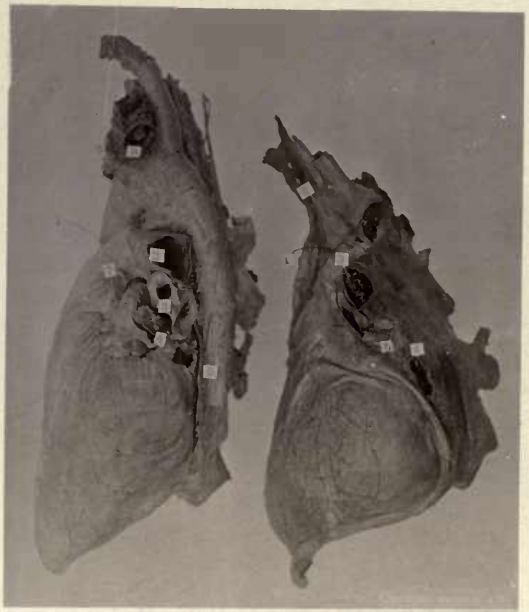
In both Specimens:—

1. Ascending aorta.
2. Aortic arch.
3. Left pulmonary artery.
4. Upper left pulmonary vein in the left specimen and lower vein in the right one.
5. Left bronchus and groove for it.

In A:—

6. Descending thoracic aorta behind the root of the left lung.
7. Left auricular appendix.
8. Formation of left innominate vein.





THORAX HEART & PERICARDIUM. No 3
SECTION III

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THORAX.

HEART and PERICARDIUM—No. 4.

TWO SPECIMENS, VIEWED FROM THE RIGHT SIDE.

The specimens have been prepared as described in a previous view (Heart and Pericardium No. 1)

The left-hand specimen shows the arrangement of the principal structures in the root of the right lung, and their relation to the superior vena cava, etc.

The right bronchus gives off at an early stage, an eparterial branch, which is accompanied by a branch of the pulmonary artery, while the main bronchus passes onwards below the trunk of that artery.

The order of structures from above downwards is therefore, eparterial bronchus, right pulmonary artery, main bronchus, pulmonary veins.

The termination of the vena azygos major is seen passing above the root of the lung. Note also the reflection of serous pericardium from the inferior vena cava.

The right hand specimen is viewed more from in front than the other, and shows the unbroken fibrous pericardial bag, and also the moulding of the aortic arch.

The figures indicate—

IN BOTH SPECIMENS:—

1. Superior vena cava.
2. Ascending aorta.
3. Right pulmonary artery, where it gives off its first branch.
4. Two right pulmonary veins.
5. Inferior vena cava.

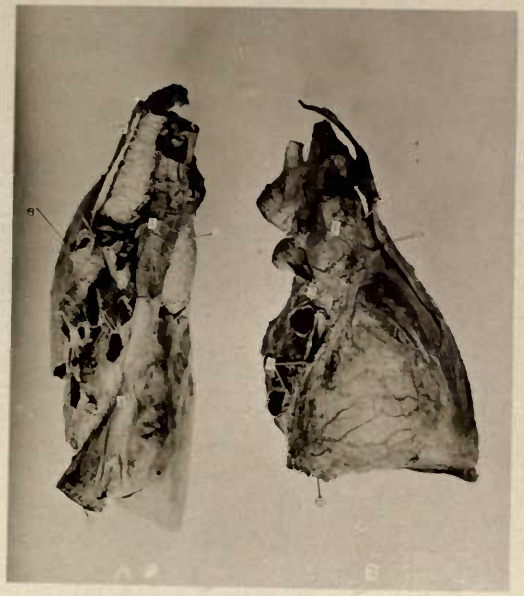
IN A:—

6. Trachea.
7. Right vagus.
8. Descending thoracic aorta.

IN B:—

9. Thymus gland.

THORAX HEART & PERICARDIUM. No. 4.



THORAX.

HEART and PERICARDIUM—No. 5.

VIEW FROM BELOW.

This specimen was prepared by detaching the margin of the pericardium along its whole circumference from the diaphragm and then lifting the entire heart and pericardial bag away. This can easily be done, since the pericardium and diaphragm are only connected by areolar tissue over the greater part of their adjacent surfaces.

The diaphragmatic surfaces of both heart and pericardium are applied to the diaphragm, and are nearly flat, and the outline of the heart, seen from this aspect, is triangular,—the apex in front and the base behind. The only orifice in this surface is that for the inferior vena cava, situated at the back and to the right side. The groove to the left side is for the oesophagus.

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The figures indicate—

1. Right margin of pericardial attachment.
2. Left margin of pericardial attachment.
3. Process of pericardium projecting forwards from the region of the apex of the heart.
4. Inferior vena cava.

THORAX.

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HEART and PERICARDIUM—No. 6.

INTERIOR OF RIGHT AURICLE AND VENTRICLE, SEEN FROM THE RIGHT.

The pericardium has been removed from the front of the heart, and the right chambers opened by removing the anterior and lateral walls. The aorta and the superior vena cava, with the margins of their pericardial investment, are seen in the upper part, and the termination of the inferior vena cava in the lower.

The sulcus terminalis is seen on the outer wall of the auricle, running from the front of the superior vena cava to the right of the inferior vena cava. In the interior of the auricle are seen the eustachian valve, the annulus ovalis surrounding the fossa ovalis, the aperture of the coronary sinus, and the foramina Thebesii.

The tortuous right coronary lies in the auriculo-ventricular sulcus.

In the right ventricle the two principal papillary muscles, anterior and posterior, are seen, and the chordae tendinae attaching them to the margins and ventricular aspects of the cusps. Some additional bands attach the valves to the lower part of the infundibulum, the smooth channel leading to the pulmonary artery

The figures indicate—

1. Line of pericardial reflection.
2. Appendix of right auricle with musculi pectinati.
3. Fossa ovalis surrounded by the annulus ovalis.
4. Eustachian valve.
5. Orifice of the coronary sinus.
6. Right coronary artery.
7. Marginal cusp of the tricuspid valve.
8. Anterior papillary muscle.
9. Anterior interventricular branch of the left coronary artery in the anterior interventricular furrow.
10. Posterior papillary muscle.

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THORAX.

HEART and PERICARDIUM—No. 7.

INTERIOR OF THE LEFT AURICLE AND VENTRICLE, VIEWED FROM THE LEFT SIDE.

The posterior wall of the auricle, and the anterior and left wall of the ventricle have been removed, and a portion of the base of the anterior papillary muscle cut away to expose the root of the posterior muscle.

The septal wall of the auricle is exposed. The left coronary artery is seen lying in the auriculo-ventricular furrow, while the tip of the auricular appendix projects forwards in contact with the root of the pulmonary artery.

The wall of the ventricle is thick and the columnae corneae are large and strong. The anterior and posterior sets of papillary muscles are seen, with the chordae tendineae attaching them to the cusps of the mitral valve.

These cusps are placed, one anterior and to the right, and the other posterior and to the left, the anterior lying in front and to the right of the auriculo-ventricular opening.

The figures indicate—

1. Depression on the septal wall corresponding to the fossa ovalis.
2. Auricular appendix.
3. Great cardiac vein.
4. Left coronary artery.
5. Anterior papillary muscle.
6. Chordae tendineae.
7. Posterior papillary muscle.
8. Septal wall of the ventricle.
9. Margo obtusus of the heart.
10. Pulmonary artery.

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HEART and PERICARDIUM—No. 8.

THE INTERIOR OF THE LEFT AURICLE SEEN FROM BEHIND.

The heart and great vessels having been removed from the body, and the pericardium covering the posterior and left sides taken away, the posterior wall of the left auricle has been removed with the terminations of the pulmonary veins. The left auricle forms the greater part of the base of the heart.

It is divided into an Atrium, with smooth wall and an Appendix (3). A portion of the wall of the atrium is formed by the interauricular septum, on which is a depression, bounded below by a crescentic margin, representing the aperture of the foramen ovale in the foetus.

The Mitral orifice is placed in the front part of the floor of the chamber, and is smaller than the corresponding aperture of the right side.

Above the auricle is the bifurcation of the pulmonary artery, and the remains of the ductus arteriosus (8).

Between the pulmonary artery and the aorta a double fold of serous pericardium is present and has been opened (5).

The figures indicate—

1. Septal wall of the auricle.
2. Mitral orifice.
3. Auricular appendix.
4. Bifurcation of the pulmonary artery.
5. Cavity of serous pericardium.
6. Inferior vena cava.
7. Great cardiac vein.
8. Ligamentum arteriosum.
9. Superior vena cava.

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HEART and PERICARDIUM—No. 9.

THE INTERIOR OF THE RIGHT AURICLE AND OF BOTH VENTRICLES VIEWED FROM THE FRONT.

The anterior portion of the wall of the cone-shaped, or ventricular, part of the heart has been removed, the pulmonary artery and aorta opened up, and the front of the right auricle removed.

The right auricular appendix projected in front of the root of the aorta and has left an impression upon it. In the interior of the auricle the openings of the venae cavae, the fossa ovalis and the eustachian valve are visible, and, in the right ventricle, portions of the marginal and septal cusps.

In the left ventricle, the aortic cusp of the mitral valve is prominent.

The shape and position of the cusps of the aortic and pulmonary valves is characteristic, one of them being posterior in the pulmonary artery and two anterior, while in the aorta one is anterior and two posterior. Both of the latter are shown, but the anterior has been removed.

The figures indicate—

1. Common pericardial investment of the pulmonary artery and aorta.
2. Above the orifice of the superior vena cava.
3. Above the orifice of the inferior vena cava, points to the fossa ovalis.
4. Septal cusp of the tricuspid valve.
5. Interventricular septum.
6. Semilunar valves of the pulmonary artery.
7. Anterior papillary muscle of the left ventricle.
8. Aortic cusp of the mitral valve.
9. Lies below and to the right of the aortic valve.

SECTION III

THORAX.

HEART and PERICARDIUM—No 10.

BACK WALL OF THE PERICARDIUM, TO SHOW THE OPENINGS FOR THE VESSELS.

The anterior part of the pericardium has been taken away, and the heart removed by dividing the ascending aorta, the pulmonary artery just before its bifurcation, the superior and inferior venae cavae and the pulmonary veins just inside the pericardium. The internal serous layer of the pericardium is seen, lining the fibrous layer, and reflected from it upon the vessels which pierce the fibrous layer, on to the surface of the heart.

The pulmonary artery and the aorta, however, are surrounded by a common tubular sheath. The pulmonary veins of each side entered the pericardial cavity by a single aperture. The reflection of the serous pericardium extending from the inferior vena cava to the right pulmonary venous opening is seen. Notice also the bifurcation of the pulmonary artery, and its right branch passing outwards behind the ascending aorta. The groove on the left side where the pericardium passes on to the diaphragm was occupied by the great cardiac vein just before it formed the coronary sinus.

The section of the aorta shows the bulging to the right, known as the **great aortic sinus**, which simulates the commencement of an aneurismal dilatation, but is probably a normal condition since it is present in the foetus.

The figures indicate—

1. The Aorta.
2. Opening of the left pulmonary veins. The aorta can be seen lying immediately behind.
3. Pulmonary artery, at its bifurcation.
4. Superior vena cava opening.
5. Opening of right pulmonary veins.
6. Inferior vena cava opening.
7. Groove for the great cardiac vein.

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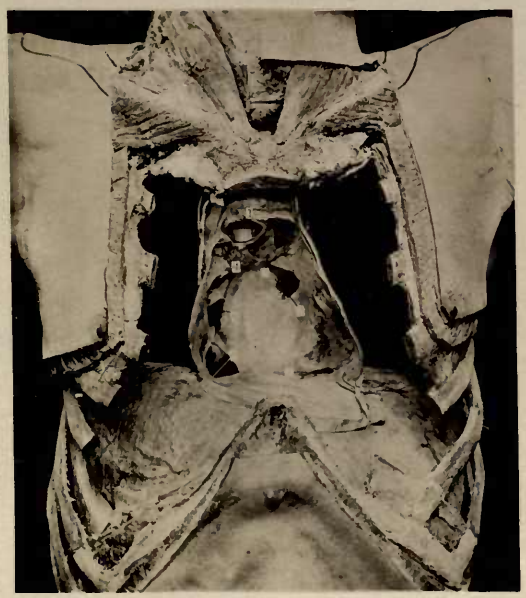

THORAX.

HEART and PERICARDIUM—No. 11.

THE AURICULAR AND VENTRICULAR PARTS OF THE HEART, SEPARATED FROM EACH OTHER.

The VENTRICULAR PORTION, with the vessels springing from it, and the termination of the trachea, is viewed from behind and the right. The general shape of this part is conical, the auriculo-ventricular apertures open into the base of the cone and the pulmonary artery and aorta rise from it in front of them. The AURICULAR PORTION has been lifted off, and turned back, and is viewed from below. The auricular portion is crescentic in outline, and the horns of the crescent embrace the origin of the great arteries, while the body of the crescent lies behind them. The natural arrangement would be restored by placing the 6 on the auricles on 6 on the ventricles, and 5 on 7.

The relative size and position of the two auriculo-ventricular orifices is well seen, the right being much larger than the left.

The figures indicate—

ON THE AURICULAR PART:—

1. Superior vena cava.
2. Right auricular appendix.
3. Left auricular appendix.
4. Hollow of auricular crescent, which contains the aorta.
5. Cavity of left auricle.
6. Cavity of right auricle.

ON THE VENTRICULAR PART:—

1. Aortic arch at its termination.
2. Trachea bifurcating.
4. Pulmonary artery.
5. Ascending aorta.
6. Tricuspid orifice.
7. Mitral valve.

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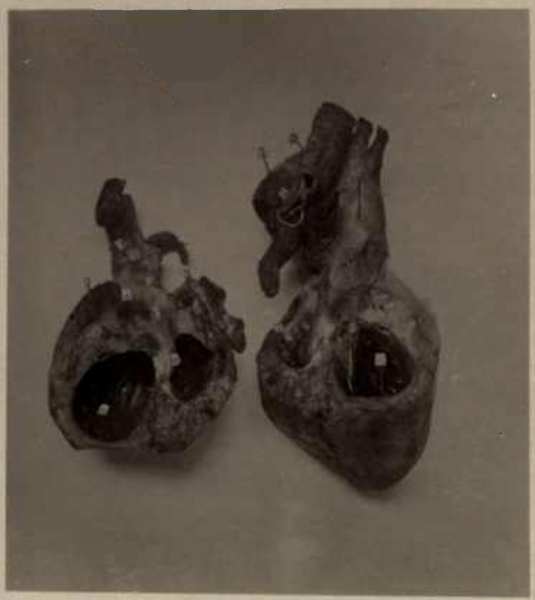

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HEART and PERICARDIUM—No. 12.

THREE VIEWS OF SECTIONS THROUGH THE VENTRICULAR PORTION OF THE HEART.

A and *B* are the two halves resulting from a coronal section, passing through the apex, *B* the front, and *A* the back part.

The principal features shown are:—(1) The left ventricle forms the apical portion of the heart, and its cavity is long and narrow, while the right ventricular cavity is shallow and wide; (2) the thickness and direction of the interventricular septum, and the occurrence of a thin part, the pars membranacea, at its upper part; (3) the relative size of the auricular ventricular orifices, and the arrangement of the cusps of the valves guarding them; (4) the aortic cusp of the mitral valve intervenes between the two openings into the left ventricle.

B shows the aortic vestibule, a portion of the left ventricle immediately below the aortic orifice, where the wall is smooth, and is fibrous in character and not muscular.

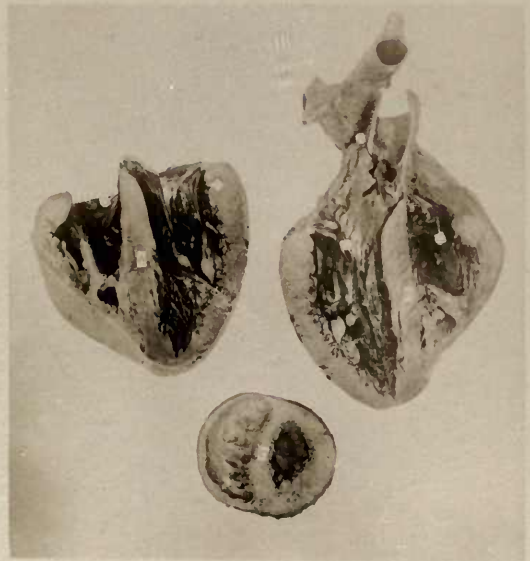
C is the inner half of a transverse horizontal section through the ventricles to show the relative thickness of the walls, and the shape and size of the ventricular chambers. The left is circular in outline, while the right is crescentic on account of the bulging of the septum to the right side.

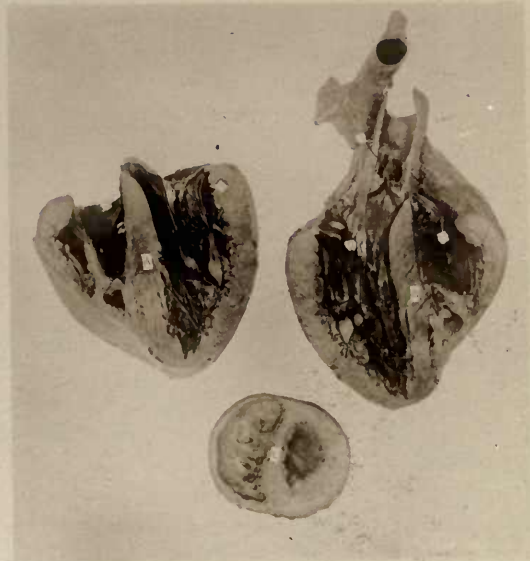
The figures indicate—

In *A*. 1. The letter rests on the interventricular septum.
2. Posterior cusp of mitral valve.
3. Septal cusp of tricuspid.

In *B*. 1. Aortic valve, below which is the vestibule.
2. Front part of segments of mitral valve.
3. Portion of tricuspid valve.

In *C*. 4. Rests on the septum,—the left ventricle lies to the right, the right on the left side.





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SECTION III